Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of

Revision of Part 15 of the Commission's	)	ET Docket No. 13-49
Rules to Permit Unlicensed National	)	
Information Infrastructure (U-NII) Devices	)	
In the 5 GHz Band	)	

COMMENTS OF INTELLIGENT TRANSPORTATION SOCIETY OF AMERICA

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SUMMARY

The Intelligent Transportation Society of America ("ITS America"), by its counsel, hereby submits its Comments regarding the *Notice of Proposed Rulemaking* ("*NPRM*") in the proceeding: "Revision of Part 15 of the Commission's Rules to Permit Unlicensed National Infrastructure Devices in the 5 GHz Band," ET Docket No. 13-49. ITS America's Comments concern the proposal in the *NPRM* to permit the operations of U-NII devices in the 5850-5925 MHz band ("5.9 GHz Band") (designated the "U-NII-4 Band" in the *NPRM*) and the possible impact on Dedicated Short Range Communications ("DSRC"), which is primary in the 5.9 GHz Band.

The Commission's NPRM proposing to permit the operation of U-NII devices in the 5.9 GHz Band raises several concerns. First, ITS America urges the Commission to ensure that there is a stable RF environment for DSRC, especially in light of the safety benefits associated with DSRC. Second, the NPRM has created significant regulatory uncertainty that is threatening to derail the progress DSRC is making toward nationwide deployment. Third, the proposal to permit sharing by U-NII devices in the 5.9 GHz Band is at best premature and cannot form the basis for a Commission decision authorizing sharing in the band. ITS America urges the Commission to affirm that it will continue to provide a stable and secure platform in the 5.9 GHz band for DSRC.

ITS America is the leading advocate for the development and deployment of communications and other advanced technologies that improve the safety, security and efficiency of the nation's surface transportation system – collectively termed "Intelligent Transportation Systems" ("ITS"). In 1997, ITS America petitioned the FCC to allocate the 5.9 GHz Band to DSRC. Since that time, ITS America has played a key role in facilitating the development and

deployment of DSRC equipment, services and applications, in partnership with the US Department of Transportation ("US DOT"), state DOTs, and its many private sector, academic and other members.

DSRC is the principal enabling technology for US DOT's "Connected Vehicle" research program, which is seeking to reduce or eliminate vehicle crashes by creating a fully connected transportation system wherein transportation data will be exchanged instantaneously between vehicles ("V2V" wireless communications) and from vehicles to the roadside ("V2I" wireless communications). DSRC is the critical link for V2V and V2I communications, enabling vehicles to have a 360 degree "view" of adjacent vehicles and roadside conditions, which the driver cannot see. Example DSRC applications include: Blind Spot Warning, Forward Collision Warning, Lane Change Warning, Intersection Collision Avoidance, and Approaching Emergency Vehicle Warning, among others. Most significant, DSRC is the only wireless data communications that has the requisite low latency – the time it takes data to reach its destination – with high reliability that is critical for the transmission of V2V and V2I safety messages.

DSRC will save the lives of the traveling public. The National Highway Traffic Safety Administration ("NHTSA") has stated that V2V applications "could potentially address about 80 percent of crashes involving non-impaired drivers once the entire vehicle fleet is equipped with V2V technology." NHTSA has also indicated that DSRC is "uniquely capable" of supporting V2V safety applications that require the instantaneous transfer of critical safety information. In addition to the very real emotional consequences to those killed and injured and their families in vehicle crashes, they have a significant economic impact on society as a whole in terms of associated medical costs, lost household income and production, emergency services, travel delay, rehabilitation, property damage, etc. The potential to reduce vehicle crashes will not only save lives and avoid injuries, but also promises tremendous benefits to society from the costs not incurred. In addition, the economic benefits to the United States from ITS, including benefits associated with DSRC-enabled applications and services, are significant – and growing.

Since the Commission allocated the 5.9 GHz Band to DSRC on a primary basis in 1999, much investment and progress has been made in support of DSRC. For example, in December 2003, the Commission adopted service and technical rules for DSRC, including a requirement that licensees utilize a single wireless transmission standard. The federal government estimates it has invested to date some $450 million in direct DSRC funding for: basic research, standards development, laboratory and field testing, prototype equipment development, and demonstrations. These efforts are on-going and DSRC is entering a critical phase that could decide whether nationwide deployment will become a reality.

Private sector support for DSRC has been equally critical. The leading vehicle Original Equipment Manufacturers ("OEMs") are partnering with US DOT to support the federal Connected Vehicle research program. These vehicle OEMs, along with vehicle Tier-1 suppliers, radio equipment manufacturers, system integrators, universities and others, are also supporting efforts to develop and deploy DSRC-based applications and services. In Ann Arbor, Michigan, there is currently an on-going pilot demonstration program involving some 3000 vehicles outfitted with DSRC radio devices to test the effectiveness of V2V and V2I safety applications. These efforts are leading to an anticipated decision by NHTSA in late 2013 (for light vehicles) and late 2014 (for trucks) regarding the future of Connected Vehicle technology and DSRC.

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To: The Commission

COMMENTS OF INTELLIGENT TRANSPORTATION SOCIETY OF AMERICA

The Intelligent Transportation Society of America ("ITS America"), by its counsel, hereby respectfully submits its Comments regarding the *Notice of Proposed Rulemaking*[1] issued by the Commission in the above-captioned proceeding.

I. INTRODUCTION

Established in 1991, ITS America is the leading advocate for the development and deployment of communications and other advanced technologies that improve the safety, security and efficiency of the nation's surface transportation system. Its members include private corporations, public agencies, and academic institutions involved in the research, design, development and deployment of Intelligent Transportation Systems ("ITS") that enhance safety, increase mobility and sustain the environment.

ITS America is uniquely positioned to provide these Comments. ITS America has been at the forefront of the development and deployment of Dedicated Short Range Communications ("DSRC") in the 5850-5925 MHz Band ("5.9 GHz Band"), which is closely associated with the

[1] *Revision of Part 15 Part of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, ET Docket No. 13-49, Notice of Proposed Rulemaking, FCC 13-22, 28 FCC Rcd 1769 (2013) ("*NPRM*").

US Department of Transportation's ("US DOT") Connected Vehicle research program. Indeed, ITS America was the petitioner in 1997 seeking to allocate the 5.9 GHz Band for DSRC. ITS America has continued to play a central role in the development of DSRC, most especially by bringing together the key stakeholders – governmental, private sector, and academic institutions – necessary to make DSRC a reality. Its current members include US DOT, state DOTs, vehicle Original Equipment Manufacturers ("OEMs"), Tier-1 equipment suppliers, DSRC device manufacturers, roadside infrastructure developers, DSRC service providers, and university research and testing centers. Additional members include the leading developers and manufacturers of unlicensed devices and infrastructure.[2]

In its Comments, ITS America provides a comprehensive discussion of the significant efforts, both public and private, to develop and deploy DSRC services and applications since the allocation of the 5.9 GHz to DSRC in 1999.[3] ITS America raises several concerns associated with the Commission's proposal to make available the 5.9 GHz Band to unlicensed uses.[4] First, the Commission must provide a stable RF environment for DSRC. This is vitally important in

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[2] ITS America emphasizes that its Comments reflect the views solely of the organization and not the views of any particular member or groups of members. Individual members may submit their own comments under separate cover.

[3] ITS America would like to acknowledge the following organizations for their leadership role in preparing these Comments: American Association of State Highway and Transportation Officials (AASHTO), Cisco, Cohda Wireless, Kapsch TrafficCom North America, Metropolitan Transportation Commission (MTC) of San Francisco, Savari Networks, and the University of Michigan Transportation Research Institute (UMTRI). ITS America would also like to acknowledge the long-time effort of the ITS America Connected Vehicle Task Force, chaired by Roger Berg of Denso North America, to encourage industry development and deployment of 5.9GHz DSRC.

[4] On February 12, 2013, before the release of the *NPRM*, ITS America submitted a letter to the Commission raising the concerns discussed more fully in these Comments regarding the possible introduction of U-NII devices in the 5.9 GHz Band. Over 60 of ITS America members co-signed the letter. A copy of the February 13, 2013 letter is attached hereto in Appendix I.

light of the need for DSRC to enable critical vehicle safety applications. Second, the *NPRM* has created significant regulatory uncertainty that is threatening to derail the progress DSRC is making toward nationwide deployment. Third, the proposal to permit sharing of the 5.9 GHz Band with unlicensed devices is at best premature and cannot form the basis for a Report and Order permitting such sharing between DSRC and U-NII devices.

II. BACKGROUND ON DEDICATED SHORT RANGE COMMUNICATIONS

DSRC is the principal enabling technology for US DOT's multi-year Connected Vehicle research program, which envisions reducing or eliminating vehicle crashes through a fully connected transportation system uniting drivers, vehicles, wireless devices and the road infrastructure.[5] A Connected Vehicle future envisions that transportation data will be exchanged instantaneously among vehicles in proximity to one another ("vehicle-to-vehicle" or "V2V" wireless communications) as well as with the road infrastructure ("vehicle-to-roadside infrastructure" or "V2I" wireless communications) to enhance mobility and improve safety. DSRC is the critical link for V2V and V2I communications, providing 360 degree "visibility" so that vehicles can "see" nearby vehicles in all directions and know of roadway conditions that the driver cannot see. As described by US DOT, DSRC encompasses two-way short-to-medium-range wireless communications capability that permits very high data transmission critical in communications-based active safety applications.[6]

[5] *See generally* http://www.its.dot.gov/connected_vehicle/connected_vehicle.htm (viewed May 10, 2013).

[6] US Department of Transportation, Research and Innovative Technology Administration, "DSRC: The Future of Safer Driver Fact Sheet," available at http://www.its.dot.gov/factsheets/dsrc_factsheet.htm. (viewed May 9, 2013) ("Safer Driver Fact Sheet').

DSRC uniquely meets the basic communications requirements for most Connected Vehicle safety applications. These requirements include:

- Range 300-500 meters, up to 1000 meters;
- One-way and two-way directionality, both to and from the vehicle;
- Both point-to-point and broadcast communications capabilities; and
- Latency of less than 100 milliseconds.

Delayed delivery of a vehicle safety message could reduce the message's relevance and/or validity to a vehicle crash avoidance application, and could result in preventable crashes and loss of life. The estimate of a vehicle's location becomes increasingly uncertain if there is a time delay in the transmission of the message. When vehicles are traveling at highway speeds, any delay in the transmission – even in milliseconds -- could adversely impact the safety of the traveling public. US DOT has concluded that DSRC is "the only available technology in the near-term that offers the latency, accuracy, and reliability needed for active safety" Connected Vehicle applications.[7]

A. How DSRC Will Save Lives

The great promise of the Connected Vehicle program, and the DSRC enabling technology, is to significantly reduce the numbers of vehicle crashes. In recent testimony before the Senate Committee on Commerce, Science and Transportation, David Strickland, Administrator of the National Highway Traffic Safety Administration ("NHTSA") stated that V2V applications "could potentially address about 80 percent of crashes involving non-impaired

[7] *Id.* Studies have compared existing LTE (cellular technology) and DSRC to provide the necessary latency and reliability under the relevant operating conditions. While DSRC does not provide ubiquitous coverage as does LTE, DSRC specifically addresses localized and mission/safety critical applications with requiring the users to make a connection decision. In addition, DSRC bandwidth capacity is sufficient to meet greater than 100 percent of worst-case load, whereas LTE capacity is insufficient to meet less than five percent of worst-case load. LTE is also a subscriber fee based serviced. A low latency dedicated spectrum is absolutely necessary for the success of mission critical applications for the infrastructure.

drivers once the entire vehicle fleet is equipped with V2V technology."[8] Administrator Strickland further explained:

> We believe V2V technology will complement and ultimately merge with the advanced braking systems and other crash avoidance technologies that we are currently evaluating to shape the future of motor vehicle safety. V2V will give drivers information needed to make safe decisions on the road that cameras and radars just cannot provide. This added capability not only offers the potential to enhance effectiveness of current production crash avoidance systems, but also enables more complex crash scenarios, such as those occurring at intersections, to be addressed.[9]

Moreover, according to NHTSA, the V2V program is reliant on the availability of the DSRC technology that operates in the 5.9 GHz Band: "This spectrum is uniquely capable of supporting a number of safety applications that require nearly instantaneous information relay."[10]

DSRC functions by enabling the instantaneous exchange of information among vehicles and the roadside that will enable vehicles to deploy crash avoidance countermeasures designed to avoid or mitigate collisions with other vehicles, roadside objects or pedestrians.[11] These crash avoidance countermeasures include alerts and in-vehicle signage to drivers to address specific crash scenarios or potentially dangerous highway conditions, as well as generic public safety alerts. DSRC may exchange data to enable tolling, commercial carrier credentialing, vehicle diagnostics and maintenance, and in-vehicle alerts and signage that displays and synthesizes

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[8] Testimony of the Honorable David L. Strickland, Administrator, National Highway Traffic Safety Administration, Before the Senate Committee on Commerce, Science, and Transportation, Hearing on "The Road Ahead: Advanced Vehicle Technology and its Implications," at 4 (May 15, 2013) ("Strickland Testimony").

[9] *Id*.

[10] *Id.*

[11] The types of vehicle information that is collected and transmitted include: latitude, longitude, time, heading angle, speed, lateral acceleration, longitudinal acceleration, yaw rate, throttle position, brake status, steering angle, headlight status, wiper status, external temperature, turn signal status, vehicle length, vehicle width, vehicle mass, and bumper height.

messaging from a wide variety of traffic control devices (*e.g*. traffic signal controllers, roadside signs and other devices).[12] A current, but not exclusive, list of DSRC-enabled V2V and V21 safety applications that have been developed utilizing DSRC, includes:[13]

- Blind Spot Warning (BSW) –V2V
- Forward Collision Warning (FCW) – V2V
- Emergency electronic brake lights (EEBL) V2V
- Do not pass warnings (DNPW) – V2V
- Intersection Movement Assistance (IMA) – V2V
- Lane Change Warning (LCW) –V2V
- Control Loss Warning (CLW) – V2V
- Approaching Emergency Vehicle Warning
- Vehicle Safety Inspection
- Transit or Emergency Vehicle Signal Priority
- Electronic Parking and Toll Payments
- Commercial Vehicle Clearance and Safety Inspections
- In-vehicle Signage
- Traffic and Travel Condition data for traveler information and maintenance services
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Eight vehicle OEMS are working closely with US DOT to develop V2V applications.[14] This five-year effort addresses eight specific crash scenarios:

- Lead Vehicle Stopped (rear end crash)
- Control Loss without Prior Vehicle Action

[12] Manual on Uniform Traffic Control Devices 2009 (MUTCD) (Revisions 1 and 2 May 2012): "Traffic control devices shall be defined as all signs, signals, markings, and other devices used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, pedestrian facility, bikeway, or private road open to public travel by authority of a public agency or official having jurisdiction, or, in the case of a private road, by authority of the private owner or private official having jurisdiction." Uniform application of traffic control devices are envisioned by the MUTCD to greatly improve the traffic operations efficiency and roadway safety.

[13] *See* "Safer Driver Fact Sheet; Crash Avoidance Metrics Partnership (CAMP) Vehicle Communications Safety 2 VSC-A Applications_NHTSA - CAMP Comparison v2" document, US DOT (May 2, 2007).

[14] These eight vehicle OEMs are providing support to US DOT through partnering agreements: Ford Motor Company, General Motors LLC, Honda R&D Americas, Inc., Hyundai-Kia America Technical Center, Inc., Mercedes-Benz Research and Development North America, Inc., Nissan Technical Center North America, Toyota Motor Engineering & Manufacturing North America, Inc. and Volkswagen Group of America, Inc.

- Vehicle(s) Turning at Non-Signalized Junctions
- Straight Crossing Paths at Non-Signalized Junctions
- Lead Vehicle Decelerating
- Vehicle(s) Not Making a Maneuver Opposite Direction (head-on crash)
- Vehicle(s) Changing Lanes – Same Direction
- Left Turn Across Path/Opposite Direction (LTAP/OD) at Non-Signalized Junctions

This research effort has already developed other DSRC applications to address common traffic control tasks, such as signal priority and common transaction-based highway services, such as electronic tolling and freight carrier safety credentialing. Future research efforts contemplate examining public safety information services localized to specific road operations, including emergency vehicle presence, work zone notification, collision incident notification, and other critical traffic information for road users. Other safety applications will likely be developed to address a wider variety of vehicle-vehicle collision categories, single vehicle crash categories, and collision categories involving vehicles and vulnerable road users such as motorcyclists, cyclists and pedestrians.

B. Avoided Costs From Reducing Crashes

According to NHTSA, in 2012, there were over 34,000 fatalities from road crashes in the United States, an increase of 5.3 percent over 2011.[15] Motor vehicle crashes are the leading cause of death for children and young adults (ages 5-29).[16] In 2009, more than 2.3 million adult drivers and passengers were treated in hospital emergency rooms in the United States.[17] It is estimated that traffic crashes as a proportion of gross national product ("GNP") for the United

[15] Strickland Testimony at 1.

[16] Centers for Disease Control and Prevention, "Injury Prevention & Control: Motor Vehicle Safety," http://www.cdc.gov/Motorvehiclesafety/index.html (viewed May 20, 2013).

[17] *Id*.

States equal approximately 2.0 to 2.3 percent of GNP.[18] Researchers studying motor vehicle crashes found that total medical and lost wages lost due to motor vehicle crashes in 2005 was approximately $100 billion.[19] The American Automobile Association ("AAA") estimated, in 2011, that the annual societal costs to the United States from traffic crashes are $299.5 billion.[20] Separately, based on a review of available academic research in 2008, US DOT updated its determination of the best present value estimate of the economic value of preventing a human fatality is $5.8 million.[21]

This catalogue of statistics demonstrates that, in addition to the very real emotional consequences to the families of those killed and injured in motor vehicle crashes, they also have a significant economic impact on society as a whole from the associated medical costs, lost household production (non-market activities occurring in the home), emergency services, travel delay, vocational rehabilitation, workplace costs, administrative costs, legal costs, and pain and lost quality of life; and property damage.[22] As noted above, NHTSA estimates that Connected Vehicle technology has the potential to address some 80 percent of crashes involving non-impaired drivers. Even if only a fraction of the 80 percent of vehicle crashes are actually

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[18] Rebecca B. Naumann, et al., "Incidence and Total Lifetime Costs of Motor Vehicle-Related Fatal and Nonfatal Injury by Road User Type, United States, 2005," Traffic Injury Prevention, 11:353-360, at 354 (2010).

[19] *Id*. at 355.

[20] AAA, "Crashes vs. Congestion: What's the Cost to Society?", Es-2 (2011) (viewed May 20, 2013 at http://newsroom.aaa.com/2011/11/aaa-study-finds-costs-associated-with-traffic-crashes-are-more-than-three-times-greater-than-congestion-costs/) ("AAA Study").

[21] U.S. Department of Transportation, Office of the Secretary of Transportation, Memorandum, "Treatment of the Economic Value of a Statistical Life in Departmental Analyses" (February 5, 2008). This figure is to be used in Departmental regulatory and investment analyses.

[22] AAA Study at 1.

avoided or mitigated, the benefits to society in lives saved and injuries avoided, and the associated economic and other costs not incurred, from the Connected Vehicle program and DSRC would still be tremendous.

C. Economic Benefits

The economic benefits to the US economy from Intelligent Transportation Systems, smart infrastructure, and advanced-technology vehicles, including benefits associated with DSRC-enabled applications and services, are significant. In August 2011, ITS America released a market study to estimate the contribution and impact of ITS on the US and North American economies. The study, "Sizing the U.S. and North American Intelligent Transportation Systems Market: Market Data Analysis of ITS Revenues and Employment,"[23] sponsored by US DOT, estimates that, in 2011, the ITS industry in the United States generated $48 billion in revenue for the US economy.[24] Of this $48 billion, the largest categories are: computer and electronic product manufacturing at $13.67 billion; professional, scientific and technical services at $12.67 billion; transportation equipment and manufacturing at $5.06 billion, and telecommunications at $4.87 billion. ITS revenues are expected to grow between $2.7 billion to $4.2 billion per year through 2015. Globally, Advanced Driver Assistance System ("ADAS") revenues totaled $23 billion in 2012 and are expected to grow to $480 billion by 2020.[25] Moreover, the ITS Market

[23] Intelligent Transportation Society of America, "Sizing the U.S. and North American Intelligent Transportation Systems Market: Market Data Analysis of ITS Revenues and Employment" (August 2011) (available at http://www.itsa.org/knowledgecenter/market-data-analysis) ("ITS Market Study").

[24] *Id*. Note, however, that the ITS Market Study does not provide breakout figures for Connected Vehicle/DSRC equipment, applications and services. One of the ITS market sectors identified in the ITS Market Study is the "Vehicle Safety Market Sector," which included DSRC-related Connected Vehicle technologies: automated vehicle systems, cooperative vehicle safety systems, vehicle safety monitoring and assistance systems, and collision notification systems.

[25] *See* http://www.abiresearch.com/press/global-driver-assistance-systems-revenues-to-reach.

Study estimates that direct ITS-related private sector employment numbers 180,000, with 445,000 total US jobs in the ITS value chain and 64,000 additional jobs expected through 2015. These jobs are also well paying, averaging more than 75 percent above the national average. Three occupations – software developer, hardware developer, and engineering – make up over 30 percent of all ITS jobs.

D. DSRC Procedural History

i. Petition for Rulemaking

In May 1997, ITS America submitted a Petition for Rulemaking to the Commission requesting an allocation of 75 megahertz of spectrum in 5.9 GHz band (5850-5925 MHz) for use by ITS on a co-primary basis with certain Federal operations and the Fixed Satellite Service ("FSS").[26] ITS America identified several reasons why the 5.9 GHz band was ideal for DSRC:[27] The propagation characteristics of the band support the critical DSRC requirements, DSRC systems had been successfully deployed elsewhere in the world, and an ITS allocation in the 5.9 GHz would be consistent with the International Telecommunications Union ("ITU") Table of Allocations for Region 2, which includes North America.

Moreover, ITS America explained that DSRC systems could operate on a primary basis with existing government and non-government users in the 5.9 GHz Band.[28] Government Radiolocation services – particularly high-powered military radars located primarily on remote

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[26] *Petition of the Intelligent Transportation Society of America to Add Intelligent Transportation Services (ITS) as a New Mobile Service with Co-Primary Status in the 5.850-5.925 GHz Band*, Intelligent Transportation Society of America (filed May 19, 1997); see Public Notice, DA 97-1106, RM 9096 (rel. May 28, 1997) ("ITS America Petition").

[27] ITS America Petition at 44-47.

[28] *Id.* at 47-51.

test sites -- operate on a primary basis in the band.[29] Non-governmental uses in the band include fixed earth station FSS uplinks,[30] located primarily on the Atlantic and Pacific costs and pointing out over the oceans, and ISM devices authorized to operate at 5725-5875 MHz,[31] both also on a primary basis.

ii. Allocation of 5.9 GHz Band for DSRC

In response to ITS America's Petition for Rulemaking, the Commission in October 1999 allocated the 75 MHz in the 5.9 GHz Band for ITS applications and adopted basic technical rules for DSRC, but deferring the adoption of licensing and service rules until a later proceeding.[32] The Commission concluded: "The record in this proceeding overwhelmingly supports the allocation of spectrum for DSRC-based ITS applications to increase traveler safety, reduce fuel consumption and pollution, and continue to advance the nation's economy. ... [W]e find that the 5.850-5.925 GHz band can accommodate a wide variety of reliable DSRC applications without significantly hindering other users of this spectrum."[33] Accordingly, the Commission adopted footnote NG160 in its Table of Allocations to reflect the spectrum allocation.[34]

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[29] *Amendment of Part 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services*, Report and Order, ET Docket No. 98-95, RM 9096, FCC 99-305, 14 FCC Rcd 18221, ¶ 24 (1999) ("*Allocation R&O*"). 47 C.F.R. § 90.371(b).

[30] 47 C.F.R. § 2.106 FN US 245.

[31] *Id* at FN 5.150.

[32] *See generally Allocation R&O*". The DSRC rules appear at 47 C.F.R. ¶¶ 90.371 to 90.383 and 47 C.F.R. ¶¶ 95.1501 to 95.1511.

[33] *Id.* at ¶1.5.

[34] NG160 reads: "In the 5850-5925 MHz band, the use of non-Federal government mobile service is limited to Dedicated Short Range Communications in the Intelligent Transportation radio service."

iii. Adoption of DSRC Licensing and Service Rules

From 2000 until 2003, ITS America, its members, US DOT, and others, worked with the Commission to develop the appropriate licensing and service rules for DSRC in the 5.9 GHz Band, culminating in the release of a December 2003 *Report and Order* adopting these rules.[35] The most significant rules include:

- Designation of a single transmission standard for DSRC devices;[36]
- Shared access to the full 75 MHz by all licensees, both public safety and non-public safety licensees;
- Non-exclusive, geographic-area licensing based on the applicant's area of operations.
- A channel plan encompassing 70 MHz (10 MHz per channel), with seven service channels and a control channel in the center of the band;
- Message priority framework with first-to-last: safety of life, public safety, non-public safety;
- Licensees to register Roadside Units by site location; and
- Vehicle On-Board Units do not require an individual license but are instead licensed "by rule."

In response, ITS America and others filed Petitions for Reconsideration and/or Clarification regarding discrete issues in the adopted licensing and service rules. ITS America requested that the adopted site registration model be revised to include "interactive frequency management," similar to what the Commission had adopted for the Wireless Medical Telemetry Service.[37] In addition, ITS America suggested that the Commission consider naming a third-

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[35] *See Amendment of the Commission's Rules Regarding Dedicated Short-Range Communication Services in the 5.580-5.925 GHz Band (5.9 GHz Band),* WT Docket No. 01-90, *Amendment of Part 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services*, ET Docket No. 98-95, RM-9006, Report and Order, FCC 03-324, 19 FCC Rcd 2458 (2004) ("*DSRC Rules R&O*").

[36] E 2213-3 Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems – 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications ("ASTM DSRC Standard").

[37] Intelligent Transportation Society of America, *Petition for Reconsideration and/or Clarification,* WT Docket No. 01-90, 2 (filed Sept. 2, 2004).

party manager(s) of the DSRC site database and requested that the Commission designate Channel 172 for vehicle safety applications.[38]

ARINC, Incorporated ("ARINC") also filed a Petition for Reconsideration in which it requested several changes to the adopted DSRC rules consistent with ITS America's filing, including:[39]

- the use of "active" spectrum management techniques, including a software based advance site review analysis to identify potential harmful interference;
- the consideration of one or more third-party managers of the site registration database;
- the adoption of a requirement that DSRC licensees construct each registered site within 12 months after registration and begin operations on at least one station within 12 months of license grant;
- the designation of Channel 172 for high-availability, low-latency safety communications (i.e.., V2V safety communications) and Channel 184 for longer-range, higher-power public safety communications;
- a request to keep open WT Docket No. 01-90 for the submission and consideration of expected revisions and updates to the adopted DSRC standard.

Subsequently, in 2006, the Commission ruled on the petitions, issuing a *Memorandum Opinion and Order* making the following changes to the DSRC rules:[40]

- Designated Channel 172 (at 5855-5865 MHz) exclusively for V2V application for accident avoidance and mitigation and safety of life and property applications;
- Designated Channel 184 (at 5915-5925 MHz) exclusively for high-power, longer-distance communications to be used by public safety involving safety of life and property, and including road intersection collision mitigation;
- Required licensees to file a notice of construction for each registered site;

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[38] *Id*. at 2-3.

[39] ARINC, Incorporated, *Petition for Reconsideration*, WT Docket No. 01-90, 3-13 (filed Sept. 2, 2004).

[40] *Amendment of the Commission's Rules Regarding Dedicated Short-Range Communication Services in the 5.580-5.925 GHz Band (5.9 GHz Band)*, WT Docket No. 01-90, *Amendment of Part 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services*, ET Docket No. 98-95, RM-9096, Memorandum Opinion and Order, 21 FCC Rcd 8961, FCC 06-110, ¶ 1 (2006) ("*DSRC MO&O*").

- Clarified that site priority attaches to prior registered sites that have been constructed within the required 12-month construction period; and
- Increased the authorized transmitting power for Roadside Unit antennas below a certain height.

The Commission agreed to accept future proposals in WT Docket No. 01-90 to revise the adopted ASTM DSRC Standard upon their publication.[41] However, the Commission declined to adopt either of two additional, related proposals in the Petitions for Reconsiderations: (1) implement a software-based prior frequency coordination protocol to avoid potential interference, or (2) establish a third party database manager(s) to coordinate and maintain site registrations.

iv. DSRC/FSS Spectrum Sharing Protocol

In 2002, the Commission sought comments on whether there was a need for prior coordination between FSS and DSRC in the 5.9 GHz Band,[42] which resulted in the two industry groups initiating direct discussions on the issue of spectrum sharing in the 5.9 GHz Band. DSRC stakeholders included ITS America, ARINC, Inc., the American Association of State Highway and Transportation Officials ("AASHTO"), and Johns Hopkins University/Applied Physics Lab. FSS stakeholders included representatives from the Satellite Industry Association ("SIA"), Intelsat, PanAmSat, SES New Skies, SES Americom. Also participating was Comsearch, a leading providing of technical, management and administrative support to the FSS and wireless

[41] *Id*. at ¶ 37.

[42] *Amendment of the Commission's Rules Regarding Dedicated Short-Range Communication Services in the 5.580-5.925 GHz Band (5.9 GHz Band)*, WT Docket No. 01-90, *Amendment of Part 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services*, ET Docket No. 98-95, RM-9096, Notice of Proposed Rulemaking and Order, 17 FCC Rcd 23136, FCC 02-302, ¶ 57 (2002). Subsequently, at the request of the industry groups, the Commission deferred from adopting any rules regarding spectrum sharing or coordination pending the conclusion of the industry-to-industry discussions. *See, e.g., DSRC R&O*, at ¶ 80; *DSRC MO&O*, at ¶ 25.

industries. The purpose of the industry-to-industry discussions was to (1) determine the potential for interference between the two services, and (2) develop guidelines and recommendations for the siting of DSRC and FSS earth stations to reduce the potential for inter-service interference. In February 2008, the two industry groups jointly submitted to the Commission, DSRC/FSS Earth Station Sharing Protocol ("DSRC/FSS Sharing Protocol" or "Protocol").[43] The DSRC/FSS Sharing Protocol includes recommended guidelines for the siting and operating of DSRC roadside units FSS earth transmit stations in the 5.9 GHz Band. Proposed rule revisions to Part 25 (for FSS) and Part 90 (for DSRC) to implement the DSRC/FSS Spectrum Sharing Protocol were also included. It was also requested that the Commission consider adopting the proposed rule changes.

E. DSRC Development and Deployment

i. Federal ITS Program

The federal ITS program dates back over 20 years. Created in 1991's Intermodal Surface Transportation Efficiency Act ("ISTEA");[44] the federal ITS program – then called "Intelligent Vehicle-Highway Systems (IVHS)" – started with a focus on implementing advanced technologies to enhance the capacity, efficiency and safety of the Federal-aid highway system.[45] Since 1991, US DOT estimates it has invested more than $450 million in direct DSRC research, development, and testing activities in connection with the federal ITS program.

[43] *See* C. Nalda, *Written Ex Parte* in WT Docket No. 01-90 and EB Docket No. 98-95 (filed Feb. 18, 2008). The DSRC/FSS Sharing Protocol remains pending before the Commission.

[44] Pub. L. 102-240 (1991). ISTEA also led to the creation of Infrastructure Vehicle Highway Systems America (IVHS), later renamed Intelligent Transportation Society of America (ITS America) that same year, established as a utilized Federal Advisory Committee.

[45] *Id*. at § 6052.

ISTEA provided approximately $659 million in federal funding for research and development over six years (FY 1992 through FY 1997). ISTEA was followed in 1998 by the Transportation Equity Act for the 21st Century ("TEA-21").[46] TEA 21 specifically called for increasing the safety of motor vehicles, particularly decreasing the number and severity of collisions. The legislation provided funding both for research, standards development and testing ($603 million) and for ITS deployment projects ($679 million) over 6 years (FY 1998 through FY 2003).[47] TEA-21 was extended numerous times, covering FY 2004, at the funding levels of the last fiscal year of legislation. In addition, in TEA 21 Congress directed the Commission to consider the spectrum needs for ITS and DSRC, specifying:

> The Federal Communications Commission shall consider, in consultation with the Secretary [of US DOT], spectrum needs for the operation of intelligent transportation systems, including for the dedicated-short-range-vehicle-to-wayside wireless standard. Not later than January 1, 2000, the Federal Communications Commission shall have completed a rulemaking considering the allocation of spectrum for intelligent transportation systems."[48]

This Congressional language led to the Commission's 1999 allocation of the 5.9 GHz Band for DSRC.

The next highway reauthorization bill, 2005's Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users ("SAFETEA-LU),[49]continued the funding split for ITS research and deployment activities for the next five years (FY 2005 through FY 2009): $550 million for ITS research; $122 million for ITS deployment (for FY 2005 only).

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[46] Pub. L. 105-178.

[47] TEA 21 was extended for an additional fiscal year, FY 2004: $110 million for research activities and $122 million for deployment activities.

[48] *Id.* at § 5206(f).

[49] Pub. L. 109-59 (2005).

SAFETEA-LU, moreover, directed US DOT to "facilitate," in conjunction with the motor vehicle industry, the introduction of "vehicle-based safety enhancing systems."[50] SAFETEA-LU was extended several times, covering FY 2010 through FY 2012, at the funding levels of the last fiscal year of the legislation: an additional $330 million ($110 million in each FY 2010 through FY 2012) for the ITS research program.

The current highway reauthorization, 2012's Moving Ahead for Progress in the 21st Century Act ("MAP-21")[51] provides an additional $200 million in funding for the ITS research program for FY 2012 and FY 2013. In MAP-21, Congress directs US DOT to carry out operational tests involving "intelligent vehicles" and "intelligent infrastructure,"[52] and prioritize efforts to "enhance vehicle safety through improved crash avoidance and protection, crash and other notifications, … and infrastructure-based or cooperative safety systems … and facilitate the integration of intelligent infrastructure, vehicle, and control technologies."[53] In addition, Congress directs US DOT to provide a report in 2015 assessing the state of DSRC and identifying a path for realizing implementation of DSRC applications and services.[54]

ii. Key Federal Government DSRC Activities

Since the Commission's 1999 allocation of the 5.9 GHz Band, there has been steady and significant progress toward the deployment of DSRC technology and applications. Both the governmental and private sectors have contributed many millions of dollars and tens of

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[50] *Id*. at § 5303.

[51] Pub. L. 112-141.

[52] *Id*. at § 53004.

[53] Id.

[54] *Id*. at § 53006.

thousands of man-hours in such activities as standards development, prototype equipment development, laboratory and field testing, and demonstrations. Federal and State efforts are continuing, and DSRC V2V and V2I communications road testing is entering a critical period that will decide whether nationwide deployment will become a reality.

US DOT, through its Research and Innovative Technology Administration ("RITA") Intelligent Transportation Systems Joint Program Office ("ITS-JPO"), NHTSA and the Federal Highway Administration ("FHWA"), has taken the lead for the Federal government in the area of DSRC foundational research and development and deployment planning. Other US DOT agencies conducting R&D and deployment planning include the Federal Motor Carrier Safety Administration ("FMCSA"), the Federal Transit Administration ("FTA") and the Federal Rail Administration ("FRA"). For its part, the Commission's Public Safety and Homeland Security Bureau ("PSHSB") has facilitated the development of the technical and service rules for DSRC, and the Department of Commerce's National Telecommunications and Information Administration ("NTIA") and National Institute of Standards and Technology ("NIST") have played roles in standards development and global harmonization. The National Transportation Safety Board ("NTSB") has also publically advocated for vehicle crash avoidance systems, of which include V2V communications, and has incorporated these technologies into their "Most Wanted List."[55]

As further described below, key federal DSRC program activities and funding support have included: basic research; "proof of concept" testing; standards development and harmonization; establishment of six independent DSRC test beds, and multiple demonstrations and "driver clinics." Academic institutions under US DOT's University Transportation Centers

[55] *See* http://www.ntsb.gov/safety/mwl10_2012.html.

program have participated in smaller scale research in development of DSRC application concepts and requirements. The ongoing US DOT Connected Vehicle "Safety Pilot" model deployment (the "Safety Pilot") conducted by the University of Michigan's Transportation Research Institute ("UMTRI") is the most ambitious demonstration of DSRC vehicle safety applications to date. The information collected from the Safety Pilot, along with the results of other key research projects, will be used by NHTSA to determine in 2013 whether to proceed with additional V2V safety research and development activities, as well as whether to consider mandating V2V devices and equipment into vehicles. .

iii. DSRC Activities in the States and Localities

State DOTs and local other road authorities have also invested substantial resources in anticipation of the deployment of Connected Vehicles in the near future. As the operators of highways, secondary and local roads, the interest of State DOTs and local transportation authorities is focused on infrastructure applications for Connected Vehicles, including both safety and mobility applications using DSRC. According to the American Association of State Highway and Transportation Officials ("AASHTO"), State DOTs are conducting DSRC research, development, testing or deployment of V2I systems involving traveler information, commercial vehicle systems, fleet vehicle programs, incident management, highway payment systems (*e.g.*, deployment of current electronic tolling systems or R&D of future Mileage Based User Fee System) and intersection safety.[56] Specific activities are in the testing, pilot, research, demonstration or planning phases.[57]

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[56] AASHTO Connected Vehicle Infrastructure Deployment Analysis, Final Report, Publication Number: FHWA-JPO-11-90, 20-21 (June 17, 2011) (available at www.its.dot.gov/index.htm) ("AASHTO Report").

[57] *Id*. at 20.

iv. Private Sector Activities and Investment in DSRC

The automobile industry similarly has devoted considerable resources to developing Connected Vehicle technology. Eight vehicle OEMs (Ford, General Motors, Honda, Hyundai-Kia, Mercedes-Benz, Nissan, Toyota and Volkswagen) have entered into partnering agreements with US DOT to support the Connected Vehicle research program. Also participating are two vehicle OEM consortia: the Vehicle Infrastructure Integration Consortium ("VIIC")[58] and the Crash Avoidance Metrics Partnership ("CAMP").[59] Other participants include vehicle Tier-1 suppliers, radio equipment manufacturers, system integrators, technical and management consultants, industry and professional associations, standards-setting organizations, industry trade associations, academic research institutions and US national laboratories. US DOT's Connected Vehicle research program is a true public-private partnership. Private sector investment is in the form of direct funding for proprietary research development and testing, as well as in the form of in-kind contributions through the partnering and other agreements with US DOT. ITS America is confident that private sector investment in DSRC – by vehicle OEMs, Tier-1 suppliers, device manufacturers, system integrators, consultants, and others – equals or exceeds the federal government's contribution.

v. Licensing

Currently, 42 entities hold DSRC licenses from the Commission. Licensees include state DOTs; local governments (counties, cities, towns); transit, thruway, bridge, tunnel and port authorities; commercial DSRC service providers, research and testing organizations, and others.

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[58] VIIC is a consortium of nine car and light truck manufacturers whose mission is to identify requirements for and represent the automotive industry regarding the national deployment of 5.9 GHz DSRC systems for cooperative safety and other applications.

[59] CAMP is a partnership of vehicle OEMs created to accelerate the implementation of crash avoidance countermeasures to improve traffic safety.

vi. Equipment Development

In support of the on-going Safety Pilot, discussed below, in 2010 US DOT provided grants to eight entities to develop prototype DSRC radio devices.[60] The devices were to be capable of generating and transmitting the Basic Safety Message ("BSM"), also referred to as the "Here I Am" or "Heartbeat" message, to other vehicles and devices using DSRC.[61] In 2011, US DOT also provided grants to three vendors to develop DSRC-based, "Aftermarket Safety Devices," which are capable of supporting V2V applications. Then, in 2012, US DOT invited four companies to provide DSRC roadside units. US DOT further advised that those entities whose devices pass the certification testing process would be placed on a "Qualified Product List" and, accordingly, be eligible for use in the Safety Pilot. Subsequently, in June 2011, US DOT selected four companies to provide DSRC roadside equipment for the Safety Pilot.[62]

DSRC equipment Tier-1 suppliers, such as Delphi, Denso, and Visteon have invested millions of R&D dollars to develop DSRC-based ADAS technology. ITS companies such as DGE, Kapsch TrafficCom, and Siemens have equally spent millions to advance and perfect wireless based ADAS. Moreover, startup companies like Autotalks, Kapsch TrafficCom, Savari

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[60] National Transportation Operations Coalition, "ITS-JPO Selects Eight Firms to Develop and Produce V2V and V2I Communications Devices") (updated Oct. 6, 2010) (available at http://www.ntoctalks.com/icdn/search.php3?search=1&kwd=DSRC&op=OR&PHPSESSID=93d40beceb35f4c69b336324d26ffe57) (viewed May 21, 2013).

[61] The BSM is based on the Society of Automotive Engineers ("SAE") Standard J2735.

[62] U.S. Department of Transportation, Research and Innovative Technology Administration, "Four Firms Selected to Provide Roadside Equipment for Safety Pilot Program" (updated Nov. 15, 2012) (available at http://www.its.dot.gov/procurements/roadside_safetypilot.htm) (viewed May 21, 2013). Attached hereto are example technical specification brochures for two 5.9 GHz DSRC transceivers currently produced by Kapsch TrafficCom and marketed in the United States: an onboard unit (Model TSS306) and roadside unit (Model MTX-9450). Both devices operate in the 5.9 GHz in accordance with the band plan adopted by the Commission and transmit utilizing both the IEEE 802.11p and IEEE 1609 standards.

have spent almost a decade of R&D and raised millions of dollars to mature DSRC-based technology.

Vendors, such as Cohda and Savari, have provided 2400 dashboard mounted "Vehicle Awareness Devices ("VADs")"for use in the Safety Pilot. In addition, Cohda and Denso have provided "Aftermarket Safety Devices" for the Safety Pilot to evaluate DSRC safety applications in vehicles without build-in or integrated communications equipment. Savari also provided the roadside units for the project. The DSRC equipment vendors are in the process of procuring the Commission equipment certification for the purposes of commercial deployments.

F. Standards Development and Harmonization

Technical standards development is a core activity for the Connected Vehicle research program and DSRC, as well as for the federal ITS program generally. Standards are critical to facilitate interoperability between and among ITS devices and components for the exchange and interpretation of data through a common communications interface.[63] As noted above, the Commission adopted the ASTM DSRC standard in its Rules.[64] In adopting the standard, the Commission acknowledged the need for and benefits associated with DSRC interoperability. The Commission stated: "[w]ithout interoperability standard that enables that enables units to communicate with one another regardless of location, equipment used, or the licensee, the overall effectiveness of DSRC operations would be drastically reduced."[65] The ASTM DSRC

[63] See US Department of Transportation, Research and Innovative Technology Program, Intelligent Transportation Systems Joint Program Office, ITS Standards Program: "About ITS Standards" (available at http://www.standards.its.dot.gov/LearnAboutStandards/ITSStandardsBackground) (viewed May 23, 2013).

[64] *Supra* nn. 35-36.

[65] *DSRC Rules R&O* at ¶ 14.

Standard is used for medium access control ("MAC") and physical layer application ("PHY") for the wireless connectivity using DSRC. It also specifies the transmitter and receiver specifications for both DSRC onboard units and roadside units. The standard also incorporates the 5.9 GHz DSRC channel plan.

There has been considerable additional work on the ASTM DSRC Standard since its incorporation into the Commission's DSRC Rules in 2003. As the ASTM DSRC Standard is based on 802.11a protocols, future developments were moved to the Institute of Electrical and Electronics Engineers ("IEEE"), the standards-setting home for 802.11. In 2010, 802.11p was approved as an amendment to the IEEE 802.11 for wireless local area networks ("WLANs") providing wireless communications while in a vehicular environment.[66] Subsequently, in 2012, 802.11p was incorporated into the general 802.11 WLAN standard.[67]

In addition, there has been concurrent work on the IEEE 1609 family of five standards. IEEE 1609 seeks to define homogeneous interferences to enable, in particular, secure V2V and V2I wireless communications.[68] The most recent IEEE 1609 standard, adopted in 2013, defines

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[66] 802.11 p - IEEE Standard for Information technology-- Local and metropolitan area networks-- Specific requirements-- Part 11: Wireless LAN MAC and PHY Specifications Amendment 6: Wireless Access in Vehicular Environments

[67] 802.11 – 2012™: IEEE Standard for Information Technology –Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN MAC and PHY Specifications

[68] *See generally* US Department of Transportation, Research and Innovative Technology Program, Intelligent Transportation Systems Joint Program Office, ITS Standards Program: "Deployment Resources: ITS Standards Fact Sheets" #80 (available at http://www.standards.its.dot.gov/Factsheets/Factsheet/80 (viewed May 23, 2013).

secure message formats and processing.[69] IEEE 1609 applies to the upper layer protocols for DSRC communications.

Yet another standard defines the DSRC message set. SAE J2735 is the source for the DSRC Message Set Dictionary, which sets forth the standard message sets, data frames and data elements for use by DSRC applications, both V2V and V2I.[70] The standard defines message formats for an a la carte message, basic safety message, emergency vehicle alert message, a probe vehicle data message, traveler advisory message, weather condition message, road condition message, and others. The basic safety message, for example, contains vehicle safety-related information that is periodically broadcast to surrounding vehicles.[71] There are also on-going efforts to harmonize these standards in international arenas, particularly with Western Europe and Japan.

G. Testing

To support testing of DSRC radio equipment, US DOT has created testing locations throughout the country to assess how Connected Vehicle technologies perform under real-world operating conditions.[72] US DOT's National Connected Vehicle Test Bed program provides facilities where developers and users can test new hardware and software to support the

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[69] IEEE Std 1609.2 – 2013 - Standard for Wireless Access in Vehicular Environments (WAVE) – Security Services for Applications and Management Messages.

[70] *See generally* US Department of Transportation, Research and Innovative Technology Program, Intelligent Transportation Systems Joint Program Office, ITS Standards Program: "Deployment Resources: ITS Standards Fact Sheets" #71 (http://www.standards.its.dot.gov/Factsheets/Factsheet/71) (viewed May 23, 2013).

[71] *Id*.

[72] *See generally* U.S. Department of Transportation, Research and Innovative Technology Administration, Connected Vehicle Test Bed Brochure: Testing Connected Vehicle Technologies in a Real-World Environment (available at http://www.its.dot.gov/testbed.htm) (viewed May 21, 2013).

advancement of Connected Vehicle technology, including V2V and V2I wireless communications utilizing DSRC. There is no cost to the developer or user to utilize the Test Bed. The first Test Bed, discussed below, is located in Michigan, where the Safety Pilot is being conducted. Since the naming of the first Test Bed in Michigan, US DOT has expended the network to five additional Test Beds: Palo Alto, California; Oak Ridge, Tennessee; Orlando, Florida; Turner-Fairbank Highway Research Center/Federal Highway Administration, McLean, Virginia; and New York City, New York. US DOT is actively soliciting applicants seeking to establish additional Connected Vehicle Test Beds. Several of the state DOTs, such as like Arizona DOT (in collaboration with University of Arizona) and Virginia DOT (in collaboration with Virginia Tech) have established Test Beds in Anthem, Arizona, and Arlington and Blacksburg, Virginia, respectively, to support various Connected Vehicle applications that are of particular concern to these states and localities.

In 2008 and 2009, US DOT sponsored "proof of concept" testing for V2V and V2I communications using DSRC. This testing, conducted at the Michigan Test Bed, involved an effort to specify, design, and build a small-scale "instantiation" of a conceptual system for future national deployment of V2V and V2I systems.[73] This testing was designed to verify mechanisms for wirelessly sending and receiving roadway information to and from vehicles, and between vehicles, regarding the following criteria: safety, mobility, private services, security, maintainability, and privacy. Participants in the "proof of concept" testing under a cooperative agreement with US DOT included the VIIC Consortium, AASHTO, suppliers of prototype DSRC radio equipment and technical and program consultants.

[73] *See* Final Report: Vehicle Infrastructure Integration Proof of Concept Executive Summary – Vehicle (May 19, 2009) (available at http://www.its.dot.gov/vii/). Additional reports on other aspects of the proof of concept testing are also available at this same webpage.

An industry-based technical association, OmniAir Consortium ("OmniAir") has developed independent testing procedures and criteria for certifying DSRC radio devices as compliant with the relevant standards, including IEEE 802.11p and IEEE 1609.[74] OmniAir serves as an independent, third-party certifier of DSRC radio devices so that users of this equipment can be confident that they will be reliable, secure and "interoperable" regardless of location and user.

H. Demonstrations and Safety Pilot Program: Driver Acceptance Clinics and Model Deployment

The Safety Pilot's purpose is to study Connected Vehicle technologies and their real-world applications. This effort will allow US DOT to gather the data and supporting information needed to determine if Connected Vehicle technologies are sufficiently mature and effective to continue with this research and consider possible regulatory actions to integrate DSRC radio devices and equipment into vehicles.[75] The Safety Pilot Program is divided into two phases: Phase One – Driver Acceptance Clinics; and Phase 2 – Model Deployment.

Phase One – Driver Acceptance Clinics. Starting in August 2011 and continuing through January 2012, US DOT and its research partners conducted a series of six "driver clinics" to assess driver acceptance of V2V safety systems and using DSRC. Specifically, the driver clinics had three objectives:[76]

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[74] *See generally* www.omniair.org.

[75] *See* U.S. Department of Transportation, Safety Pilot Connected Vehicle Technology, Fact Sheet: "Improving Safety and Mobility Through Connected Vehicle Technology" (2012) (available at http://icsw.nhtsa.gov/safercar/ConnectedVehicles/pages/resources.html) ("Safety Pilot Fact Sheet")

[76] *See* M. Lukuc, National Highway Traffic Safety Administration, U.S. Department of Transportation, Light Vehicle Driver Acceptance Clinics, Preliminary Results (May 21, 2012) (available at http://icsw.nhtsa.gov/safercar/ConnectedVehicles/pages/resources.html).

- Obtain feedback on connected vehicle technology and safety applications from a representative sample of drivers;
- Assess the performance and reliability of 5.9 GHz DSRC communications and GPS in diverse geographic locations and environmental conditions; and
- Promote V2V-safety technology and potential safety benefits.

Sixteen vehicles from the OEM partners were equipped with six different V2V safety systems: Forward Collision Warning ("FCW"), Emergency Electronic Brake Lights ("EEBL"), Blind Spot Warning/Lane Change Warning ("BSW/LCW"), Left Turn Assist ("LTA"), Intersection Movement Assist ("IMA") and Do Not Pass Warning ("DNPW"). Over 700 persons were able to experience these safety systems in scenarios run by professional drivers as well as by driving some of the vehicles themselves. US DOT reports that there was overwhelming support (9 out of 10) from participants who indicated that they would like to have these safety applications in their vehicles and believe the technology would be useful in improving vehicle safety.[77]

Phase Two – Model Deployment. The Safety Pilot began in August 2012 in Ann Arbor, Michigan. It is a 30-month safety model deployment pilot program of V2V and V2I safety applications and is being conducted by US DOT and UMTRI.[78] The Safety Pilot is designed to determine the effectiveness of DSRC vehicle safety applications to reduce vehicle crashes and to learn how drivers in the real-world respond to these devices and applications in their vehicles. The testing phase will occur over 12 months and involves almost 3000 private, commercial and fleet vehicles (cars, trucks and buses) across 75 miles of local roads instrumented with roadside

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[77] Safety Pilot Fact Sheet at 3.

[78] *See generally* RITA, Intelligent Transportation Systems Joint Program Office, Fact Sheet: "Connected Vehicle Safety Pilot Program" (viewable at http://www.its.dot.gov/factsheets/pdf/SafetyPilot_final.pdf); University of Michigan Transportation Research Institution, "Safety Pilot Model Deployment" (viewed on May 21, 2013 at http://www.umtri.umich.edu/divisionPage.php?pageID=505).

transmitters. The vehicles have been outfitted with a mix of DSRC communications devices: vehicle awareness devices,[79] retrofit safety devices,[80] and integrated safety systems[81] or aftermarket safety devices, all of which enable wireless communications between vehicles and the roadside infrastructure. All the communications devices transmit the BSM 10 times per second that other vehicles use, along with the vehicle's own data, to determine whether a potential traffic hazard exits.[82] Four safety applications are being studied:[83]

- Forward Collision Warning ("FCW")– Warns the driver if he/she fails to brake when a vehicle in the driver's path is stopped or traveling slower and there is a potential risk of collision.
- Lane Change Warning/Blind Spot Warning ("BSW/LCW") – Warns the driver when he/she tries to change lanes if there is a car in the blind spot or an overtaking vehicle.
- Emergency Electronic Brake Light Warning ("EEBL")– Notifies the driver if there is a vehicle ahead (or several vehicles ahead), including those that the driver may not be able to see, but is braking hard.
- Intersection Movement Assist ("IMA") – Warns the driver when it is not safe to enter an intersection, such as when something is blocking the driver's view of opposing or crossing traffic.

Overall, the Safety Pilot's research goals are:

- Demonstrate connected vehicle technologies in a real-world, multi-modal environment;

[79] A "vehicle awareness device" is an aftermarket electronic device installed in a vehicle without connection to vehicle systems. This device does not generate warnings, but transmits only a vehicle's speed and location. U.S. Department of Transportation, Safety Pilot Connected Vehicle Technology, Questions & Answers About DOT's Safety Pilot "Model Deployment," 2 (2012) (available at http://icsw.nhtsa.gov/safercar/ConnectedVehicles/pages/resources.html) ("Model Deployment Questions & Answers").

[80] A "retrofit safety device" is an electronic device installed in a truck or bus by an authorized service provider after the vehicle has completed the manufacturing process. The device is integrated into the vehicle bus and in-vehicle sensors. *Id.*

[81] "Integrated safety systems" are electronic devices during vehicle production and are connected to the vehicle bus and in-vehicle sensors. Available for both light vehicles and trucks. *Id.*

[82] Safety Pilot Fact Sheet at 4.

[83] Model Deployment Questions & Answers at 2.

- Determine driver acceptance of vehicle-based safety systems;
- Evaluate feasibility, scalability, security, and interoperability of DSRC technology; and
- Assess options to accelerate safety benefits.[84]

As was the case for the driver clinics, data collected from the Safety Pilot will be used by NHTSA to determine whether to continue with V2V safety research and a possible regulatory decision in 2013.

I. NHTSA's 2013 Regulatory Decision

The collected data and results from the Connected Vehicle research program, and especially the two phases of the on-going Safety Pilot, will be used by NHTSA to assess how connected vehicle and DSRC technology can improve safety, and whether they can be effectively deployed under real-world conditions.[85] These efforts also lead up to an anticipated decision on commencing possible NHTSA regulatory proceedings in late 2013 (for light vehicles) and late 2014 (for trucks) regarding the future of connected vehicle technology. Pursuant to its authority to promulgate and enforce Federal Motor Vehicle Safety Standards,[86] NHTSA's decision could take several possible forms, including mandatory deployment of connected vehicle technology in vehicles, recommend voluntary installation of wireless radio devices in vehicles, or call for additional research and development, or a combination of these.

Concurrent with NHTSA's analysis and decision-making on Connected Vehicles, US DOT is also developing its plans for nationwide deployment of DSRC roadside infrastructure. In

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[84] University of Michigan Transportation Research Institute, Brochure: "Safety Pilot Model Deployment" (viewable at http://www.umtri.umich.edu/content/SafetyPilot_brochure_v3.pdf).

[85] *See* National Highway Traffic Safety Administration, Vehicle to Vehicle Communications for Safety, available at http://icsw.nhtsa.gov/safercar/ConnectedVehicles/pages/v2v.html (viewed May 21, 2013).

[86] *See generally* 49 C.F.R. Part 571.

accordance with the Congressional directives in MAP-21,in 2015, US DOT is scheduled to: (1) complete identification of all requirements for DSRC infrastructure deployment (standards, technical, policy, etc.); and (2) report to Congress on nationwide DSRC implementation plans.[87]

J. Near-Term Deployments

Connected Vehicle deployments are already taking place. Several states, including in Minnesota, California, Idaho, New York, Arizona, Washington State, Michigan, and Virginia, are implementing or planning Connected Vehicle projects using DSRC: in-vehicle signage, stop-sign assist, signal prioritization at intersections, commercial vehicle administration and credentialing, collection and dissemination of "probe" data for real-time weather and traffic conditions, among others.[88] Starting in 2009, Virginia DOT has been leading a cooperative effort of several state DOTs, select counties, local transportation authorities and universities to conduct planning and evaluation of possible large-scale deployments of Connected Vehicle applications that can assist efforts for managing transportation systems.[89]

Private sector entities also are moving ahead with Connected Vehicle/DSRC deployments. For example, Kapsch TrafficCom, a developer of DSRC radio devices, is partnering with Help Inc., a public-private partnership that provides automatic commercial vehicle credentialing, in a pilot deployment in Indiana, Ohio and Illinois to use DSRC at commercial vehicle inspection stations.[90]

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[87] U.S. Department of Transportation, Notice of *Ex Parte* Presentation, WT Docket No. 01-90 and ET Docket No. 98-95, attached slide deck at 3 (July 30, 2012) ("July 2012 US DOT *Ex Parte* Presentation").

[88] *See* AASHTO Report at 21-22.

[89] *Id.* at 22.

[90] *See* Kapsch TrafficCom, Brochure: "e-Screening Pilot Corridor Powered by 5.9 GHz," attached hereto.

K. Middle Class Tax Relief and Job Creation Act of 2012

i. Band-Sharing Study

On February 22, 2012, President Obama signed into law the Middle Class Tax Relief and Job Creation Act of 2012 ("Spectrum Act").[91] The Act included multiple significant provisions affecting spectrum, including for DSRC. Section 6406 of the Spectrum Act directs NTIA to conduct spectrum sharing studies regarding the 5350-5470 MHz band ("5.4 GHz Band") and the 5.9 GHz band -- "evaluating known and proposed spectrum-sharing technologies" and the potential risk to "Federal users" if unlicensed "U-NII devices" are permitted to operate in these two bands, particularly unlicensed wireless broadband services.[92] Section 6406 further specifies that NTIA is to provide its report to Congress regarding the spectrum sharing study for the 5.4 GHz band not later than eight months after enactment of the Act (October 2012), and its report on the 5.9 GHz band sharing study not later than 18 months after enactment (August 2013).[93]

Subsequently, on January 25, 2013, NTIA released its Congressionally-directed report, in which it consolidated the studies of each of the 5.4 GHz Band and 5.9 GHz Band: "Evaluation of the 5350-5470 MHz and 5850-5925 MHz Bands Pursuant to Section 6406(b) of the Middle Class Tax Relief Act of 2012."[94] The NTIA Report evaluates the risks to DSRC associated with

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[91] Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. 112-96 (signed Feb. 22, 2012) ("Tax Relief Act").

[92] *Id.* at § 6406(b).

[93] *Id*.

[94] US Department of Commerce, National Telecommunications and Information Administration, "Evaluation of the 5350-5470 MHz and 5850-5925 MHz Bands Pursuant to Section 6406(b) of the Middle Class Tax Relief Act of 2012" (released Jan. 25, 2013) ("NTIA Report").

allowing unlicensed U-NII devices to operate in the 5.9 GHz Band.[95] NTIA identifies four (4) "risk factors" to DSRC from unlicensed U-NII devices:[96]

- Risk Element 1: Existing U-NII regulations were not developed to detect DSRC signals;
- Risk Element 2: U-NII signal detection technologies may not be capable of detecting DSRC signals;[97]
- Risk Element 3: Current U-NII regulations were not developed to protect non-co-located transmitters and receivers; and
- Risk Elements 4: Changes to U-NII DFS detection parameters may not protect DSRC systems from serious performance degradation.

The NTIA Report discusses possible mitigation techniques associated with each of the identified risk elements; however, NTIA notes that the potential introduction of U-NII devices in the 5.9 GHz Band presents "significant technical challenges."[98] Accordingly, NTIA proposes a comprehensive and robust "quantitative evaluation" to determine the feasibility of introducing U-NII devices into the 5.4 GHz and 5.9 GHz Bands. In Table 6-2 of the Report, NTIA details a tentative two-year schedule – from January 2013 through December 2014 -- and identification of milestones for the proposed quantitative evaluation.[99] NTIA anticipates conducting this analysis

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[95] Regarding its consideration of DSRC, the NTIA wrote: "For the purpose of this study, NTIA treats DSRCS systems like a federal system in assessing the feasibility of allowing U-NII devices to operate in the 5850-5925 MHz band." *Id*. at 5-2. ITS America agrees with NTIA's approach given the significant public safety benefits to be gained from the successful implementation of DSRC services and applications.

[96] *Id*. at 5-10 to 5-12.

[97] NTIA further suggests that its proposed evaluation consider four possible spectrum sharing techniques for U-NII devices to detect DSRC signals: energy detection, matched filter detection, signal detection, and geo-location detection. *Id.* at 5-10 to 5-11.

[98] *Id*. at 6-2.

[99] *Id*. at 6-4 (Table 6-2: Tentative Schedule and Milestones for Completing Quantitative Evaluation). NTIA further notes that this effort would enable "timely reporting" by the United States as part of the ITU-R broadband agenda item for the 2015 World Radio Congress. *Id*. at 6-3.

in collaboration with the Commission, industry and federal stakeholders.[100] For DSRC, NTIA also identifies several specific activities that should be undertaken in the proposed quantitative evaluation:[101]

- Examine if the risks to DSRC systems can be addressed by extending the existing 5725-5825 MHz band U-NII regulations to the 5850-5925 MHz Band;
- Examine if additional technical constraints on U-NII devices operating in the 5850-5925 MHz band are necessary to protect DSRC systems.
- Examine whether using the RF physical layer of the 802.11ac standard would improve sharing between U-NII devices and DSRC systems.

ii. Commission Spectrum Sharing Rulemaking

In addition, the Spectrum Act required the Commission to commence a rulemaking to allow unlicensed U-NII devices to operate in the 5.4 GHz band if the Commission finds that: (1) unlicensed users will be protected by technical solutions; and (2) the primary mission of Federal users will not be compromised by the introduction of unlicensed devices.[102] The Act did not similarly require the Commission to commence a rulemaking proposing sharing of the 5.9 GHz Band with unlicensed U-NII devices. In fact, the first publicly released draft of the spectrum reform legislation ultimately included in the Tax Relief Act, in July 2011 by Representatives Waxman (D-CA) and Eshoo (D-CA), called for the Commission to initiate a rulemaking to make available the 5.9 GHz Band along with the 5.4 GHz Band to U-NII devices.[103] However, that provision for the 5.9 GHz was ultimately dropped from the final version of the Spectrum Act enacted in February 2012 but retained for the 5.4 GHz Band.

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[100] *Id*. at 6-2.

[101] *Id*. at 5-13.

[102] Tax Relief Act at § 6406(a).

[103] U.S. House of Representatives, 112th Congress, H.R. 2520, Spectrum for Innovation Act, § 1(a)(1).

Within a month of the release of the NTIA Report, the Commission released the *NPRM*[104] that is the subject of these Comments. Although Congress did not require in the Spectrum Act that the Commission to commence a rulemaking for the 5.9 GHz Band, the Commission is nonetheless proposing to add a permitted use in the 5.9 GHz Band for unlicensed U-NII devices, [105] recognizing also that DSRC operations must be protected under its pre-existing primary status in the band.[106] Public comments are sought on this proposal. The Commission also seeks comments on the NTIA Report.[107]

III. THE COMMISSION MUST PROTECT THE PRIMARY DSRC SPECTRUM ALLOCATION

For over 20 years the Commission has been a key partner in the public and private sector efforts to improve roadway safety and save lives on our highways. Its support has been steadfast in the deployment of life saving ITS systems and technologies. In 1985 the Commission granted a waiver of its Rules to permit the deployment of the first vehicle radar collision warning system.[108] The Commission promoted the deployment of electronic toll systems in the early 1990s, fostered the development of E-911 systems and technologies and assigned 511 nationally for traveler information systems in July 2000,[109] among other actions. In its 1999 Order

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[104] *See supra* n. 1.

[105] *NPRM* at ¶¶ 14, 22.

[106] *Id.* at ¶ 101.

[107] *Id*. at ¶ 104.

[108] *Vehicle Radar Safety Systems, Inc. Petitions for Waiver and Amendment of FCC Rules Part 15 for a Vehicle Collision Avoidance System*, Order Granting Limited Waiver, RM-4840, 100 FCC 2d 1598 (1985).

[109] *Use of N11 Codes and Other Abbreviated Dialing Arrangements*, Third Report and Order and Order on Reconsideration, CC Docket No. 92-105, 15 FCC Rcd 16753 (2000).

allocating the 75 MHz in the 5.9 GHz Band for DSRC, the Commission observed that "DSRC applications are a key element in meeting the nation's transportation needs into the next century and in improving the safety of our nation's highways. With this goal in mind, we agree with the DOT that it is important to provide sufficient spectrum to facilitate the development and growth of DSRC applications."[110]

The Commission's allocation of spectrum for the development and deployment of life saving DSRC technologies has provided the platform for the standards development work that followed, for the development and testing of prototype systems and the formulation of service rules, including designation of Channels 172 and 184 for High Availability Low Latency, and Higher Power Public Safety, respectively. DSRC equipment has been certified and licenses issued for systems now operating in 20 states. DSRC safety applications, including intersection collision avoidance, blind-spot warning, lane change warning, forward collision warning, among others, have been successfully demonstrated at multiple industry events and conferences, including the 2011 ITS World Congress held in Orlando, Florida and the 2012 ITS America Annual Meeting held in Washington, D.C.[111] Collectively, public and private sector investment totaling in the billions of dollars have been made in the development of DSRC systems and technologies and many business plans now depend upon the availability and suitability of the DSRC spectrum.

The Commission is directed by the Communications Act of 1934 to encourage the provision of new technologies and services to the public (Section 7) and to assign bands of

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[110] *Allocation R&O* at ¶ 1.9.

[111] A video produced by CAMP demonstrating V2V applications can be accessed at this US DOT webpage: http://www.its.dot.gov/library/media/7connectedvehicle.htm.

frequencies “as public convenience, interest, or necessity requires…”[112] (Section 303) The Commission’s allocation of the 5.9 GHz band for the deployment of DSRC systems and technologies that can and will improve safety on the nation’s roadways and save lives is well grounded in both fact and law and must not be disturbed now or disrupted by the introduction of uses incompatible with their safe operation and robust deployment.

ITS America recognizes that the Commission must ensure that the radiofrequency spectrum, a scarce national resource, is utilized with maximum efficiency. ITS America acknowledges the factors that impacted the Commission s decision to include consideration of the 5.9 GHz band in the *NPRM*, including the need for more spectrum to accommodate broadband,[113] the development of the IEEE 802.11ac standard, and the potential for deployment of wideband 160 MHz channels to accommodate next generation Wi-Fi and other uses,[114] and the expectation that similarities in the technical requirements for DSRC and U-NII devices could facilitate band sharing.[115]

Since the release of the *NPRM*, however, many parties, ITS America members and others, have expressed concern regarding the potential impact of the introduction of unlicensed devices into the 5.9 GHz band upon the suitability of the band for DSRC. For example, in its May 20, 2013 edition, *TR Daily* quoted Greg Rohde speaking on behalf of ITS America member Savari Networks, a maker of DSRC radio equipment, that the *NPRM* has had a “chilling effect”

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[112] 47 U.S.C. §¶ 157, 303.

[113] *NPRM* at ¶ 80.

[114] *Id.* at attached Statement of Commissioner Ajit Pai.

[115] *Id.* at ¶ 95.

in discussions with potential investors.[116] DSRC technology has matured significantly and the Test Beds are demonstrating that DSRC will soon be ready for market deployment. Concerns about a potentially pre-mature decision or lingering regulatory uncertainty with respect to the integrity of the 5.9 GHz band may have a negative impact on a very promising emerging market for DSRC-based safety applications.

U-NII devices are considered "unlicensed" and, as such, their operations are subject to operation consistent with Part 15 of the Commission's Rules[117] rather than under a specific licensing regime (such as is the case for DSRC). The *NPRM* proposes to revise Part 15 to permit the operation of U-NII devices in additional spectrum at 5 GHz, including the 5.9 GHz Band.[118] As a co-primary allocation in the 5.9 GHz Band, Commission rules and precedent require that DSRC be protected from interference from secondary users. Even if the Commission were to ultimately determine that DSRC and U-NII devices could successfully share the 5.9 GHz Band, U-NII devices, as an unlicensed service, must not cause interference to DSRC operations and accept any interference from DSRC. Moreover, if they do cause interference, then U-NII devices must cease operating immediately. The Commission's *NPRM* recognizes this legal structure.[119]

U-NII device compliance with Part 15 requirements does not necessarily mean that the proposed spectrum sharing in the 5.9 GHz can be successfully realized. The potential risk from harmful interference to primary users in shared bands is illustrated in the *NPRM* regarding

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[116] *TR Daily*, "Rohde Bemoans Impact of 5 GHz NPRM On Connected-Vehicle Firm," (May 20, 2013).

[117] *See generally* 47 C.F.R. Part 15.

[118] *NPRM* at ¶ 1.

[119] *Id.* at ¶¶ 1, 3, 101.

Terminal Doppler Weather Radar ("TDWR") that holds primary status in the 5.60-5.65 GHz Band.[120] Field tests conducted by NTIA determined that TDWR operations were suffering interference from U-NII devices. Specifically, according to the *NPRM*, it was found that uncertified U-NII devices were nonetheless operating in the 5.60 to 5.65 GHz Band[121] The Commission found that, in many cases, "the inference was caused by third parties modifying the device's software configurations to enable operation in frequency bands other than those for which the device had been certified but without meeting the technical requirements for operating in those frequency bands."[122] The interference problem to TDWR was first discovered in early 2009; resolution via revised compliance and measurement procedures for U-NII devices remains pending,[123] some four years later.

Given the critical safety applications associated with DSRC, careful scrutiny of potential U-NII sharing of the 5.9 GHz must be undertaken. The TDWR example illustrates that compliance with Part 15 technical requirements may not suffice to guarantee that DSRC devices will not suffer harmful interference from U-NII devices operating the 5.9 GHz band, despite their legal status as "unlicensed" devices and DSRC's co-primary status. At this critical moment for DSRC deployment, the regulatory uncertainty arising from the *NPRM* potentially casts doubt in the minds of key decision makers, company planners and investors. This, in turn, poses the unintended and unwarranted risk of impeding the progress of DSRC deployment and potentially impairing the ability of NHTSA to reach a key decision expected later this year. ITS America

[120] *See NPRM* at ¶¶ 8-10.

[121] *Id.* at ¶ 9.

[122] *Id.*

[123] *Id.* at ¶ 10.

therefore urges the Commission to engage directly and pro-actively with public sector and private sector parties seeking to further deployment of DSRC to affirm that it will continue to provide a stable and secure platform in the 5.9 GHz band for DSRC deployment, including stating unequivocally that it will protect the use of this spectrum for V2V safety applications and preserve NHTSA's ability to make its possible regulatory decisions in 2013 and 2014.

IV. THE NPRM'S PROPOSAL TO PERMIT SHARING OF THE 5.9 GHZ BAND BY UNLICENSED DEVICES IS UNSUPPORTED AND PREMATURE

In the Spectrum Act, Congress expressly separated consideration of the 5.4 GHz and 5.9 GHz bands. It provided NTIA eight months to compete a study of the feasibility of sharing the 5.4 GHz band and 18 months to complete a study of sharing of the 5.9 GHz Band. In addition, the Spectrum Act required that the Commission commence a rulemaking for the 5.4 GHz band but imposed no such requirement on the 5.9 GHz band. In fact, Congress deleted initial language that called for the Commission to commence a rulemaking for the 5.9 GHz Band. The separate treatment accorded the two bands reflected Congress's intent that protection of the primary allocations of the 5.9 GHz band, especially DSRC, required full study and analysis that was not able to be completed in the same time frame as the 5.4 GHz band. NTIA's study considered both bands concurrently, but beyond identifying risks of sharing the DSRC band with unlicensed devices principally concluded that further and complete testing was required.

The *NPRM* suggests that U-NII devices may utilize both indoor and outdoor applications by proposing to apply U-NII-3 rules, as modified, to the 5.9 GHz Band (the proposed U-NII-4) band.[124] Specific technical emissions rules for U-NII operations are also proposed.[125] The *NPRM* seeks comments but makes no proposal regarding band sharing. Absent a specific

[124] *Id*. at ¶ 97.

[125] *Id*.

sharing proposal that can be tested, the Commission cannot meaningfully reach a decision on acceptable radio emissions parameters. Moreover, commenters do not currently have a means to analyze the potential for band sharing since there is no specific proposal or proposals. Given the complex issues raised and the critical development of DSRC for safety services, it is implausible that the Commission could adopt a final rule simply on this *NPRM* and responding comments.

The NTIA Report postulates the potential that these U-NII devices may not be able to sense (and hence avoid) DSRC signals, are not being designed with knowledge of DSRC devices and present risks that U-NII devices may interfere with DSRC operations. There is much information sharing that needs to occur between the DSRC and U-NII communities in order to analyze and address the sharing risks raised in the NTIA Report and as may be otherwise identified. The *NPRM* poses technical questions regarding the optimal sharing technique (*e.g*., sensing, geo-location, pilot channel).[126] Before addressing these issues, however, the Commission must first address risks identified by the NTIA Report and find that sharing of the 5.9 GHz Band with unlicensed devices will not compromise the safety of the traveling public. Accordingly, the public record on the *NPRM*, while no doubt informative, cannot form the basis for definitive action by the Commission to permit the entry of unlicensed devices into the band.

ITS America recognizes that spectrum is a scarce national resource and that efficient use of the spectrum, especially that portion that has been to safety, contributes to the national interest. However, the proposal to share spectrum allocated for safety of life services with unlicensed devices must face a high burden of demonstrating that DSRC will not be compromised. That will require, as NTIA found, a deliberative process that evaluates carefully

[126] *Id*. at ¶¶ 105-108.

and fully a necessary and robust testing protocol. ITS America supports and will participate in that process but cautions against any final action in the absence of a full technical record..

V. CONCLUSION

DSRC holds the promise of significantly reducing the number and societal costs associated with vehicle crashes. However, the *NPRM*'s proposal to permit U-NII devices to operate in the 5.9 GHz Band is premature and cannot form the basis for a decision allowing such sharing, and has created significant regulatory uncertainty for DSRC. ITS America urges the Commission to affirm that it will continue to provide a stable and secure platform in the 5.9 GHz band for DSRC.

Respectfully submitted,

INTELLIGENT TRANSPORTATION SOCIETY OF AMERICA

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Its Counsel

May 28, 2013

ACRONYMS

AAA	American Automobile Association
AASHTO	American Association of State Highway and Transportation Officials
ADAS	Advanced Driver Assistance System
ARINC	ARINC, Incorporated
ASD	Aftermarket Safety Device
ASTM	American Society for Testing and Materials
BSM	Basic Safety Message
BSW/LCM	Blind Spot Warning/Lane Change Warning
CAMP	Crash Avoidance Metrics Partnership
CDC	Centers for Disease Control
Commission	Federal Communications Commission
DNPW	Do Not Pass Warning
DSRC	Dedicated Short Range Communications
EEBL	Emergency Electronic Brake Lights
FCW	Forward Collision Warning
FHWA	Federal Highway Administration, US DOT
FMCSA	Federal Motor Carrier Safety Administration, US DOT
FTA	Federal Transit Administration, US DOT
FRA	Federal Rail Administration, US DOT
FSS	Fixed Satellite Service
GHz	Gigahertz
GNP	Gross national product
IEEE	Institute of Electrical and Electronics Engineers
IMA	Intersection Movement Assist
IVHS	Intelligent Vehicle-Highway Systems
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITS	Intelligent Transportation Systems
ITS America	Intelligent Transportation Society of America
ITS-JPO	Intelligent Transportation Systems Joint Program Office, US DOT, RITA
ITU	International Telecommunication Union
LTA	Left Turn Assist
LTE	Long Term Evolution network
MAC	Medium access control
MAP-21	Moving Ahead for Progress in the 21st Century Act of 2012
NHTSA	National Highway Traffic Safety Administration, US DOT
NPRM	Notice of Proposed Rulemaking
NIST	National Institute of Standards and Technology
NTIA	National Telecommunications and Information Administration, Department of Commerce
NTSB	National Transportation Safety Board
OEM	Original Equipment Manufacturer
PHY	Physical layer application
PSHSB	Public Safety and Homeland Security Bureau, FCC
RITA	Research and Innovative Technology Administration, US DOT

SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act of 2005
Safety Pilot	Connected Vehicle Safety Pilot Program
Spectrum Act	Middle Class Tax Relief and Job Creation Act of 2012
TDWR	Terminal Doppler Weather Radar
TEA-21	Transportation Equity for the 21st Century Act of 1998
U-NII	Unlicensed National Information Infrastructure
UMTRI	University of Michigan Transportation Research Institute
US DOT	US Department of Transportation
VAD	Vehicle Awareness Devices
VIIC	Vehicle Infrastructure Integration Consortium
V2I	Vehicle-to-roadside infrastructure wireless communications
V2V	Vehicle-to-vehicle wireless communication
WLAN	Wireless local area network
5.4 GHz Band	5350-5470 MHz Band
5.9 GHz Band	5850-5925 MHz Band

APPENDIX I

ITS AMERICA

Intelligent Transportation Society of America
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Washington, DC 20036 www.itsa.org

February 12, 2013

The Honorable Julius Genachowski
Chairman
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554

Dear Chairman Genachowski:

We, as members, partner organizations and stakeholders of the Intelligent Transportation Society of America, are writing to express our support for the evaluation process laid out by the National Telecommunications & Information Administration (NTIA) in its report on the potential use of up to 195 megahertz (MHz) of spectrum in the 5 gigahertz (GHz) band by Unlicensed-National Information Infrastructure (U-NII) devices.

We respectfully ask the Commission to allow for due diligence on this critical issue by ensuring that any timelines contained in a proposed rulemaking relating to the 75 MHz of spectrum in the 5850-5925 MHz (5.9 GHz) band are consistent with the NTIA schedule for completing its quantitative evaluation and issuing final recommendations, and do not precede a decision by the U.S. Department of Transportation (DOT) regarding implementation of a connected vehicle network which has the potential to greatly reduce the 6 million crashes and more than 30,000 deaths which occur on U.S. roadways annually.

We would note that while Congress required the Commission to modify its regulations to allow certain unlicensed use of spectrum in the 5.4 GHz band as part of the Middle Class Tax Relief and Job Creation Act of 2012, a similar requirement for the 5.9 GHz band was removed from the final legislation, which called only for the NTIA study and did not direct the Commission to modify its regulations. This decision reflects the recognition by Congress of the life-saving potential of connected vehicle technology and the unknown but potentially serious complications associated with allowing unlicensed devices to operate in the band.

As NTIA stated in its report, connected vehicle technology "will enhance safety on the nation's highways", potentially addressing "80 percent of the crash scenarios involving non-impaired drivers" according to U.S. DOT's National Highway Traffic Safety Administration (NHTSA). The report also cites NHTSA research showing that connected vehicle technology "could help prevent the majority of types of crashes that typically occur in the real world, such as crashes at intersections or while changing lanes."

We share NTIA's concern about the potential risks associated with introducing a substantial number of unlicensed devices into the 5.9 GHz band on which connected vehicle systems are based, and support NTIA's conclusion that further analysis is needed to determine whether and how the multiple risk factors could be mitigated. We furthermore agree that "the FCC and NTIA must determine that licensed users will be protected by technical solutions and that the primary mission of federal spectrum users will not be compromised before adopting service rules authorizing U-NII devices" to operate in the band.

The connected vehicle community – including ten major automakers and numerous technology providers – has invested hundreds of millions of public and private sector dollars on research and development under the auspices of U.S. DOT's Connected Vehicle Research Program.

In August 2012, the U.S. DOT-sponsored Connected Vehicle Safety Pilot was launched in Ann Arbor, Mich., in which nearly 3,000 cars, trucks and transit buses have been equipped with Dedicated Short Range Communications (DSRC) radio devices to collect vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) performance data. This data will be used by NHTSA to inform a potential regulatory decision in late 2013 for new light-duty vehicles, and in 2014 for new heavy-duty vehicles. That decision will be a major milestone in the national and international implementation of V2V and V2I communications systems for crash avoidance.

The Safety Pilot represents the largest model deployment of its kind and is the culmination of years of effort and hundreds of millions of dollars of investment by the U.S. government, automakers, and other public and private sector leaders. In addition to the financial investment by American taxpayers and the private sector, the implementation of connected vehicle technology will create thousands of jobs while significantly reducing the $300 billion per year in economic costs associated with vehicle crashes on our nation's roads.

We stand ready to work with NTIA, the wireless industry, and other federal and non-federal stakeholders to evaluate the feasibility of existing, modified, proposed and new spectrum sharing technologies and approaches. However, this process should be allowed to proceed without a predetermination by the FCC that spectrum sharing in the 5.9 GHz should be the ultimate outcome.

We support efforts to identify spectrum that may be utilized to expand Wi-Fi applications. But with over 30,000 deaths on our nation's roads every year, we also believe it is critical that efforts to open up additional spectrum do not come at the expense of revolutionary life-saving technologies.

Thank you for your consideration. We look forward to working with you on this critical issue.

Sincerely,

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Intelligent Transportation Society of America
(ITS America)

Mitch Bainwol
President and CEO
Alliance of Automobile Manufacturers

Jill Ingrassia
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President & CEO
Eberle Design Inc.

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IBI Group

VII Consortium

APPENDIX II

Kapsch TrafficCom

MTX-9450.
5.9 GHz Transceiver.

The 5.9 GHz transceiver MTX-9450 is a compact road-side infrastructure device utilizing wireless communications in the 5.9 GHz Dedicated Short Range Communication (DSRC) band. MTX-9450 supports the 802.11p WAVE standard for information exchange with on-board equipment in multi and single-lane environments. In combination with the Kapsch road-side controller, the MTX-9450 transceiver supports USDOT safety pilot applications including required IEEE 1609.2 security protocols. MTX-9450´s built-in directed DSRC antenna enables reduced interference from adjacent receivers. Additionally, the transceiver supports external antennas.

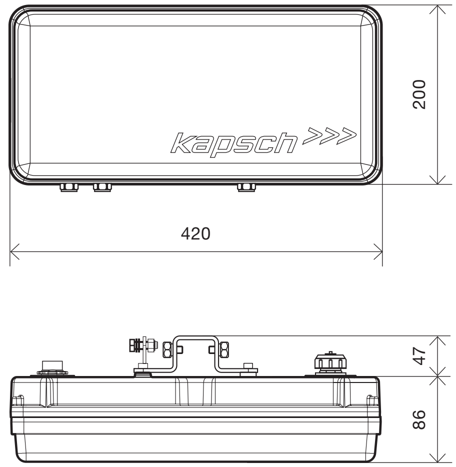
The design concept and basic technologies are derived from extensive experience in developing and producing microwave devices dedicated to road tolling applications. MTX-9450 transceivers are part of Kapsch TrafficCom's 9000 series communication devices intended for 5.9 GHz applications. They are provided on a hardware platform designed and optimized for harsh roadside environments.

5.9 GHz radio section and antenna array.
Built-in directional antenna arrays provide radio coverage within an application specific communication zone. The radio section provides flexible parameterization to adapt to specific site conditions.

Host controller.
The powerful micro controller manages communication with vehicle on-board devices and exchanges transactions with the host system. It also handles authentication and encryption security in cooperation with the built-in SAM. The transceiver operating system is Linux based.

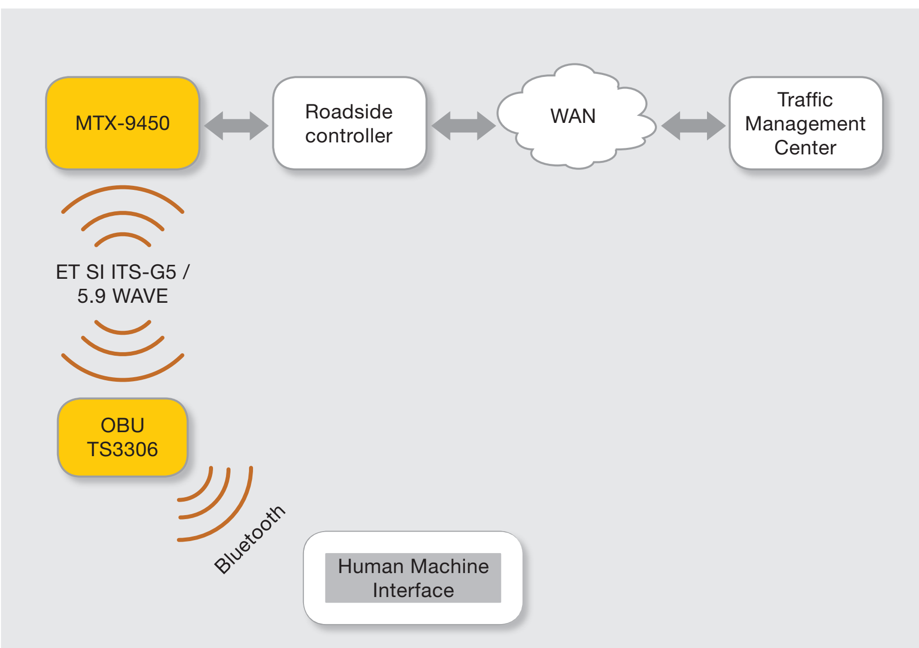
Mechanical design.

All components are integrated in a rugged aluminium die cast. The surface finish of all metal parts resists all environmental stresses defined in the related standards.



(All dimensions in mm).

Internal functional modules of the MTX-9450:



Technical Features

Mechanical
- Dimensions: 420 x 200 x 86 mm
- Enclosure: Aluminium die-cast
- Weight approx.: 6 kg

Electrical
- Frequency band:
  - 5.850 – 5.925 GHz
  - 10 MHz Channels:
  - 172, 174, 178, 180, 182,184
- 20 MHz Channels:
  - 173, 175, 177, 179, 181, 183
  - Radiated power: +33dBm EIRP maximum, adjustable
  - Supply voltage: 24/48V nominal
  - Power consumption: max. 24W

Antenna
- Built-in directional
- External via Type N connector

Interfaces
- 2 x 10/100 Ethernet
- 2 x Serial RS4222
- 2 x external WAVE Antenna N connector female
- 1 x external GPS N connector female
- USB 2.0
- Secure Access Module – SAM

Environmental Conditions
- Operating temperature range:
  - (-34 °C to +74°C)
- Storage temperature range:
  - (-40° C to +85° C)
- Protection classification: NEMA 4X, IP67
- Vibrations: MIL-STD 810F Method 514,
  - I, Category 24
- Shock: MIL-STD 810F Method 516.5,
- Proc IV
  - Salt mist: IEC 60068-2-56 Cb and 60068-2-30Db
  - MTBF: ≥ 200,000 h under normal environmental conditions

Security (digital signature and encryption)
  - 3DES, AES, ECC (optional)

Protocol standards
  - IEEE 802.11p and IEEE 1609

Kapsch Group.

Kapsch is one of Austria's most successful technology corporations, specialized in the future-oriented market segments of Intelligent Transportation Systems (ITS), Railway and Public Operator Telecommunications as well as Information and Communications Technology (ICT). Kapsch. Always one step ahead.

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Kapsch TrafficCom

TS3306.
On-Board Unit.

The TS3306 on-board unit is a lightweight and compact model in the PREMID® TS3300 series of on-board units, designed for applications serving commercial vehicle operations and road tolling markets as well as for the USDOT's Connected Vehicle Safety Pilot program.

The TS3306 designed for the 5.9 GHz Dedicated Short Range Communication (DSRC). It supports both vehicle-to-vehicle and vehicle-to-roadside communications.

Ease of installation.
Attach to the front windshield like a toll tag, connect to the vehicle power and it is ready to go in minutes. An optional mounting bracket can be used to detect device removal by a user.

User interface at hand.
LEDs and a built-in buzzer inform about its status. A push button can enable self declaration of vehicle passengers for HOT-lanes. Additionally, TS3306 on-board unit can link to a smartphone or a PDA via a Bluetooth wireless link. Road signage, traveler advisories, toll transactions can be displayed by an application running on the user devices.

Open Standards.
TS3306 implements WAVE standards including IEEE 802.11p, IEEE1609 (IEEE 1609.2, IEEE 1609.3, IEEE 1609.4, IEEE 1609.11) and SAE J2735.

Data Security.
The on-board unit supports over-the-air security including encrypted and digitally signed messages. The 128-bit Advanced Encryption Standard (AES) security and the elliptic-curve cryptography specified in the IEEE 1609.2 standard are implemented.

GPS positioning.
The built-in GPS receiver makes the device aware of its own location. Traffic information and road signage can now be displayed where it is most convenient and relevant for a user. Additionally, TS3306 supports infrastructure-supported localization technology.

Flexible interfaces.
Besides Bluetooth, the TS3306 also supports USB and an optional CAN vehicle interface which expand device versatility.

TS3306 is being tested in several field and pilot tests. It is also targeted toward the US DOT Qualified Product Listing for the US DOT Connected Vehicle Safety Pilot.

Target 5.9GHz DSRC Applications:

- Commercial vehicle inspection
- Electronic toll collection
- HOT lanes
- Electronic Payment & Access control
- Transit Signal Priority
- Traveler Information (SAE J2735 formats)
- Signal Phase & Timing (SAE J2735, CAMP formats)
- Applications for the USDOT Safety Pilot
  - Curve Speed Warning
  - Cooperative Intersection Collision Avoidance System – Violations
  - Vehicle Awareness Device application (Basic Safety Messages)
  - Vehicle safety advisories (Basic Safety Messages)

Features.

- Compatible with IEEE 802.11p and 1609.3, . 4 and .11 specifications
- AES 128 bit authentication and 1609.2 security
- Bluetooth interface to laptop or smartphone
- Built-in GPS receiver
- User feedback and self-declaration capabilities

Technical Features

WAVE communication
- IEEE 802.11p
- IEEE 1609.3, .4 and .11

Power Supply
- 12 / 24 V DC vehicle power supply

Security
- AES-128 bit security, 1609.2 security

MMI
- Buzzer >55 dBA @ 1 m
- Configurable buzzer tunes
- LEDs
- Button

Casing
- Two-toned color PC/ABS

Dimensions
- 3.15 in. x 2.36 in. x 1.18 in.

Weight
- 2.82 oz

Interfaces
- Internal DSRC and GPS antennas
- Optional external DSRC Antenna
- Bluetooth
- MicroSD card
- USB interface

Accessories
- Mounting bracket

Temperature range, storage
- -40° - +85°
- (IEC 60721-2-1)

Temperature range, operating
- -40° - +85°
- (IEC 60721-2-1, including solar radiation)

Humidity
- Max 95% rel humidity, non condensing
- (IEC 60721-3-5, Class 5K2)

Communication
- Built-in GPS receiver

Kapsch Group.
Kapsch is one of Austria's most successful technology corporations, specialized in the future-oriented market segments of Intelligent Transportation Systems (ITS), Railway and Public Operator Telecommunications as well as Information and Communications Technology (ICT). Kapsch. Always one step ahead.

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e-Screening Pilot Corridor
Powered by 5.9 GHz

Pilot Carriers

- Indiana Western
- Old Dominion
- Ultimate Logistics
- UPS
- Venture Logistics

What is an E-Screening Pilot?

Help Inc., collaborating with Kapsch TrafficCom, is conducting an e-screening Pilot Corridor with the objective of demonstrating the power of automated e-screening utilizing 5.9 GHz DSRC (Designated Short Range Communications) – the chosen technology for the USDOT Connected Vehicle Safety Pilot program. This pilot is a unique opportunity for state commercial vehicle enforcement officials and pilot carriers to work together with the objective of providing unique value to all parties.

Who is Participating?

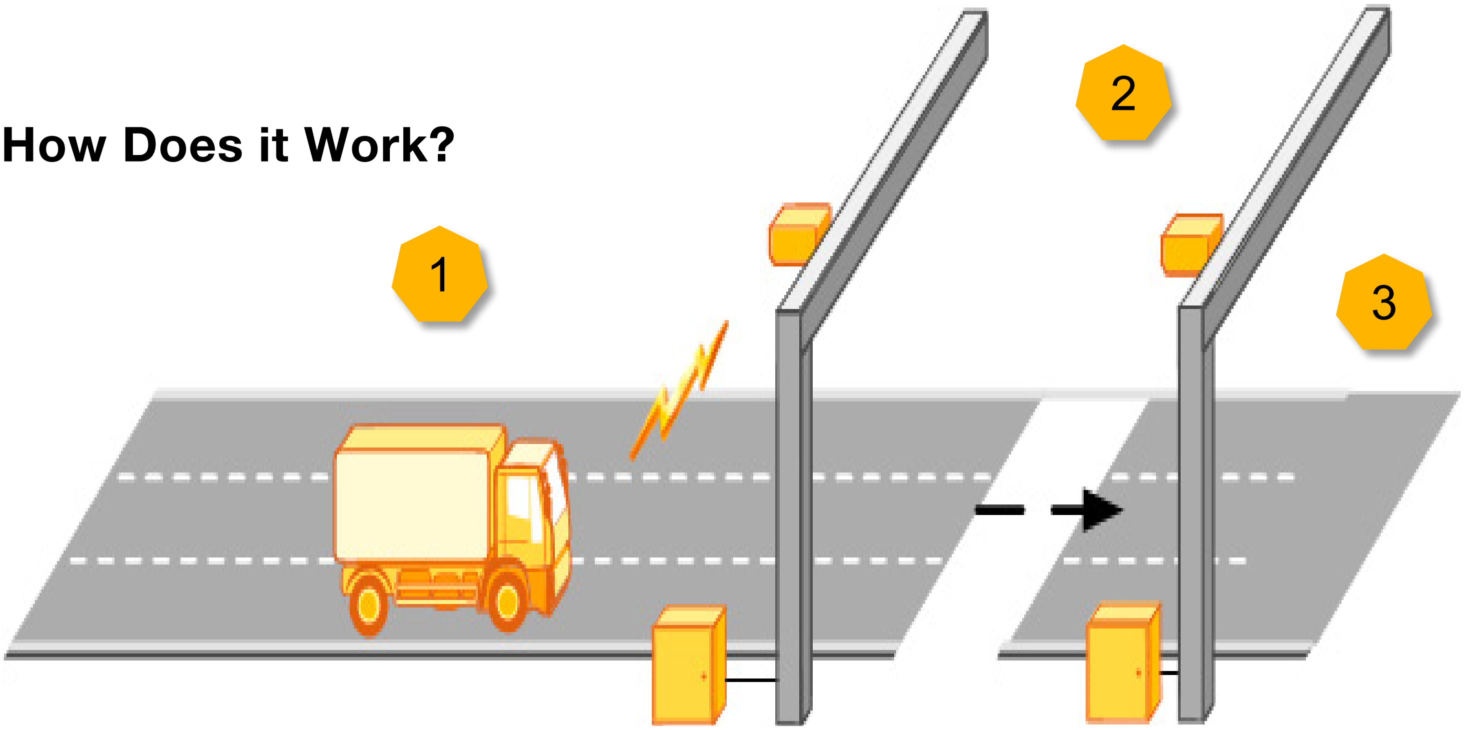
Help Inc. has recruited a number of industry leading commercial vehicle carriers to participate in the pilot. Along with these carriers, the states of Indiana, Ohio and Illinois have agreed to update six inspection stations with technology provided by HELP Inc. and Kapsch TrafficCom.

Kapsch TS3306 OBU

Key Benefits

Carriers	Saves time, money and fuel
	Levels the playing field by ensuring greater carrier compliance
	Screening based on driver and vehicle health information
States	Integrated display of information of all carriers (mainline and in-station)
	Data warehouse for post-roadside interventions
	Data driven inspection station
	Weight compliance data can reduce highway maintenance costs
	Screening based on driver and vehicle health information

How Does it Work?



1

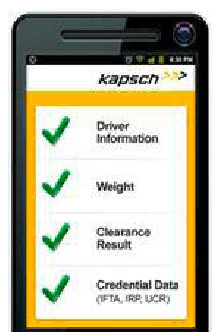
Collect

- Carrier driver enters their data into Onboard Unit (OBU)
- OBU data transmitted to transceiver
- Trip information stored on OBU and forwarded to 360SmartView

2

Determine

- 360 SmartView receives OBU data
- Determines bypass result
- Sends result data to 5.9 system



3

Respond

- OBU receives response from 360SmartView
- Response forwarded to the OBU
- OBU presents response data to driver
- Inspection credential data stored

Definitions	
360SmartView Database	Comprehensive commercial vehicle screening tool
Transceiver	Roadside 5.9 GHz DSRC interfaces OBUs to 360SmartView
Onboard Unit	In-vehicle 5.9GHz DSRC device links vehicle to roadside
Handheld Device	Bluetooth enabled device which interfaces the 5.9 OBU

Kapsch Group
The Kapsch Group and its entities Kapsch TrafficCom, Kapsch CarrierCom und Kapsch BusinessCom are specialised in the future-oriented market segments of Intelligent Transportation Systems (ITS) and Information and Communication Technology (ICT). Kapsch. Always one step ahead.

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